ABSTRACT

The present invention is a method for determining a parameter of interest of a region of interest of the earth. At least one component of potential fields data is measured at a plurality of locations over a region of interest including a subterranean formation of interest. The potential fields data are selected from magnetic data and gravity data. An initial geophysical model is determined for the region including the subterranean formation of interest. For the model, geophysical tensor data is updated using a forward model at a plurality of locations using a High Order Compact Finite Difference method. A difference between the estimated model value and the measured value of the potential field measurements are determined, and the geophysical model is updated. The model is iteratively updated and compared to the measured data until the differences reach an acceptable level and the parameter of interest has been determined.